Course Title: Communication systems	Course Code: EEC2247	Second Year
Date: 7-6-2015	Allowed time: 3 hrs	No. of Pages: (2)

Answer all the following questions:

Question (1) (20 degrees)

(1) Find the trigonometric Fourier series for the periodic waveform shown in Figure (1).

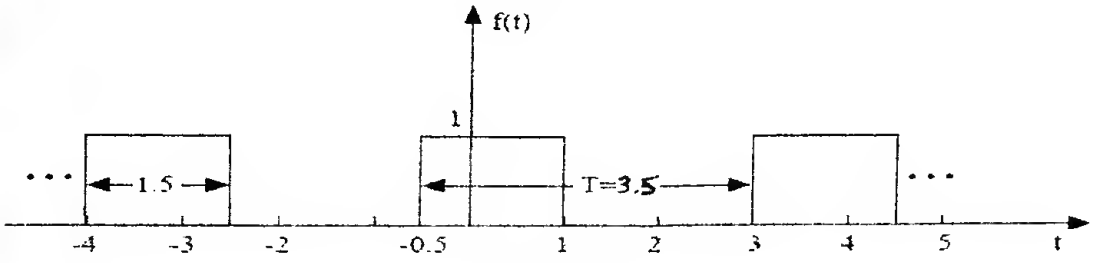


Figure (1)

(2) Find the complex Fourier series for the periodic delta waveform shown in Figure (2). and calculate the average power using the Parasevel's theorem.

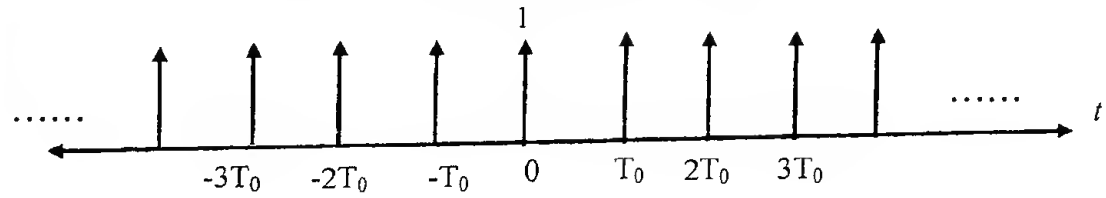


Figure (2)

Question (2) (15 degrees)

(1) Prove that:

$$u(t) \xrightarrow{F.T} \frac{1}{2}\delta(f) + \frac{1}{j2\pi f}$$

(2) Find the Fourier transform of the following signals:

(a) $x(t) = 10rect\left(\frac{t}{4}\right)\cos(8\pi t)$.

(b) $w(t) = 2\delta(t-2) + \text{sgn}(t-4)$.

(c) $g(t) = 2e^{-\pi t^2}$, and find the area under theg(t).

Question (3) (30 degrees)

(1) An AM signal has a form of $s(t) = [20 + 2\cos(3000\pi t) + 10\cos(6000\pi t)]\cos(2\pi f_c t)$ where f_c=10^5 Hz the signal is fed to a 100 Ω load:

a. Determine and sketch the spectrum of the AM signal.
b. Determine the average power for the carrier and the sidebands.
c. What is modulation factor?

d. What is the peak power delivered to the load?

e. Explain one method that can be used to generate the AM signal.

(2) A signal $m(t) = 5\cos(6000\pi t)$, is transmitted by DSB-SC modulator by using a carrier $c(t) = 10\cos(12000\pi t)$, determine the following:

a. The spectrum of the DSB-SC signal.

b. Identify the frequencies in the baseband, and the corresponding frequencies in the USB and LSB spectra.

c. Show, how you can recover the baseband signal from the DSB-SC wave by using the Costas's receiver.

Question (4) (15 degrees)

(1) Derive an expression to obtain the SSB wave ***s(t)*** from a baseband signal ***m(t)*** .

(2) Explain the modulator used to generate the SSB signal.

(3) Define the FDM technique.

Freq Division Multiplexing

Question (5) (20 degrees)

1. As shown in figure (3) an FM transmitter where the bandwidth of an audio input is 3kHz, the oscillator has a frequency of 80.015 MHz, and the bandpass filter is centred around the carrier frequency that is located at 143 MHz. The FM exciter has a carrier frequency of a 21 MHz, and a peak deviation of 0.694 kHz. Calculate the carrier frequency and the peak deviation for the FM signals at points B, C, D, E, and F. Calculate the bandwidth of the bandpass filter.

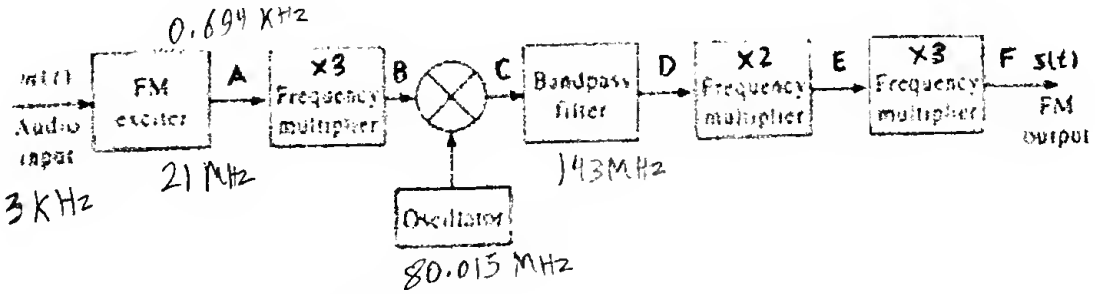


Figure (3)

2. A carrier wave of frequency 100 MHz is frequency modulated by a sinusoidal wave of amplitude 20 volts and frcquency 100 kHz. The frequency sensitivity of the modulator is 25 kHz per volts determine the following:

a. The bandwidth of the FM signal, using Carson's rule.

b. The FM wave expression in the time domain and in the frequency domain.

c. Explain one method used to generate FM wave and one method to demodulate it.

Good Luck

Dr. *Entessar Seed*

Tanta University

Department: Engineering Physics and Mathematics
Total Marks: 85 Marks

Faculty of Engineering

Course Title: Mathematics(3B) Course Code: PME2211 Year: 2nd(Computer &Control Dep.)
Date: June 4th 2015 (Second term) Allowed time: 3 Hrs No. of Pages: (2)

Q(1)(20 Marks)

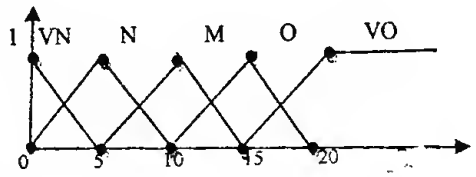
(a) Show that the set $A = \int \left(\frac{1}{\sqrt{1+5x}}\right)_x$ is convex (5 Marks)

(b) Consider the fuzzy sets F and G defined in interval [0,10] by the memberships $\mu_F(x) = 5^{-x}$ and $\mu_G(x) = \frac{1}{1+3(x-2)^2}$ .Determine the mathematical formulas and graphs of memberships functions of

(i) $\mu_{\bar{F}}$ and $\mu_{\bar{G}}$ (ii) $\mu_{F\cup G}$ and $\mu_{F\cap G}$ (8 Marks)

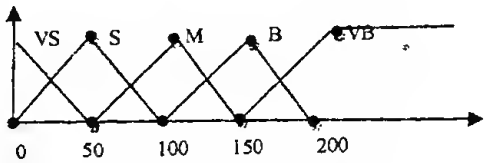
(c)A fuzzy system constructed to get the price of a car type with respect to car age and distance .The manufactured data say that this system has two inputs that are age and used distance, one out put which is car price, where $\mu_A(x)$, $\mu_B(x)$ and $\mu_C(x)$ are memberships represents car age, used distance by care and price with thousands

$\mu_A(x)$



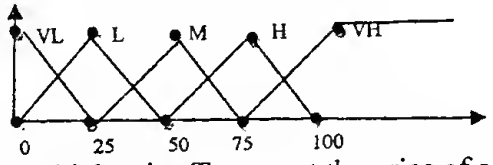
VN = Very new, N= new, M = medium,
O = old, VO = Very old

$\mu_B(x)$



VS = Very small, S= Small, M = medium,
B = Long , VB = Very Long

$\mu_C(x)$



VS = Very low price, L= Low price,
M = medium price, H = high price ,

VH = Very high price.Try to get the price of a care manufactured since 6 year ago and used it in distance 80000 km . (7 Marks)

Q(2)(20 Marks)

(a) Show that if f(z) is analytic then $\nabla^2 |f(z)|^2 = 4 \left|\frac{df(z)}{dz}\right|^2$ (7 Marks)

(b) Show that if $f(z) = u(x,y) + iv(x,y)$ is analytic, then u(x,y) and v(x,y) are harmonics. (6 Marks)

(c) Determine c such that the function is harmonic U = sinx coshcy and find its conjugate harmonic. (7 Marks)

$s^{\frac{1}{2}} \rightarrow \frac{1}{2} s^{-\frac{1}{2}}$

Q(3)(20 Marks)

(a) Prove that If f (z) is analytic in a simply-connected region D, then for every simple closed curve C in D, $\oint_C f(z)dz = 0$ (6 Marks)

(b)Evaluate $\oint_C \frac{z^3+1}{(z-1)(z-2)}dz$ around $C:|z|=3$. (7 Marks)

(c) Find Taylor expansion of (7 Marks)

$f(z)=\frac{z}{5-z}$ on the region $|Z|\le 5$ and using it to find $\sum_{n=1} \frac{r^n}{5^n}\cos n\theta$, $\sum_{n=1}\frac{r^n}{5^n}\sin n\theta$

Q(4)(20 Marks)

(a) Evaluate $\oint_{|z|=2} \frac{z^2 \sinh \frac{2}{z-1}}{(z-3)(z-1)}\,dz$ $4\pi i$ (7 Marks)

(b) Using Bromwich contour To find inverse Laplace transform of $F(s)=\frac{\cosh x\sqrt{s}}{s\cosh\sqrt{s}}$, $0<x<1$ (7 Marks)

(c) Find the image of the region $2\le|z|\le 3$, $\frac{\pi}{6}\le argz\le\frac{\pi}{3}$ **by the map** $w=z+\frac{1}{z}$. (7 Marks)

Q(5)(25 Marks)

a) Using series solutions to solve the following equations (8 Marks)

(i) $x^2y''+xy'+(x^2-\frac{4}{9})y=0$ near x=0

(ii) $(x^2+1)y''+y'+y=e^x$ near x=0

b) Evaluate the following using Gamma and Beta functions (9 Marks)

$3+\frac{1}{27}$ $\frac{1}{\pi\cdot 2^{2n}}$

(ii) $\int_0^\infty x^3 e^{-2x}\cosh x\,dx$, $\int_0^{\frac{1}{2}} x^{m-1}\left(\ln\frac{1}{2x}\right)dx$

(ii) Show that $\beta\left(n+\frac{1}{2},\frac{1}{2}\right)=\frac{(2n)!\ \pi}{2^{2n}\ (n!)^2}$

(c) Use Generating function $e^{x(t-\frac{1}{t})}=\sum_{-\infty}^{\infty}J_n(x)t^n$ to prove that: $e^{\frac{x}{2}}$ (8 Marks)

(i) $e^{ix\sin\theta}=J_0(x)+2\sum_{n=1}^{\infty}J_{2n}(x)\cos 2n\theta+2i\sum_{n=0}^{\infty}J_{2n+1}(x)\sin(2n+1)\theta$

(ii) $1=J_0(x)+2\sum_{n=1}^{\infty}J_{2n}(x)$ (iii) $x=2\sum_{n=0}^{\infty}(2n+1)J_{2n+1}(x)$

• Dr. Mohamed Shokry and the committee

Title: Computer graphics
Final exam, Date: 11 /6/2015, **Total marks:** 75
Course code: CCE2211 **Year:** Second year
Allowed time: 3 hours

Workout the following questions (15 marks for each question)

1) a) Define *Computer Graphics* and show how it is different from *Image Processing.*

b) The memory in a frame buffer must be fast enough to allow the display to be refreshed at a rate sufficiently high to avoid flicker. A typical workstation display can have a resolution of 1280 x 1024 pixels. If it is refreshed 72 times per second, how fast must the memory be? That is, how much time can we take to read one pixel from memory? What is this number for a 480 x 640 display that operates at 60 Hz but is interlaced?

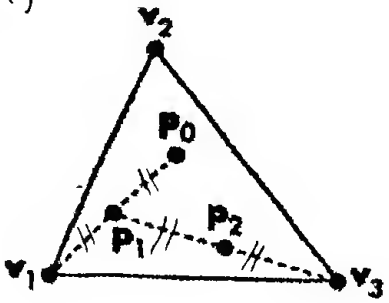
2) a) Explain with examples when possible the following: OpenGL graphics library functions can be generally classified into primitive functions, attribute functions, viewing functions, transformation functions, input functions, control functions and query functions

b) *Sierpinski* gasket is an interesting shape that has a long history and is of interest in areas such as fractal geometry. It is an object that can be defined recursively and randomly; in the limit, however, it has properties that are not at all random. In its two dimensions version, it is formed using three points in the plane z = 0, let these points are specified as (x_1 y_1 0), (x_2> y_2, 0), and (X_3, y_3, 0). The construction of the gasket proceeds as follows:

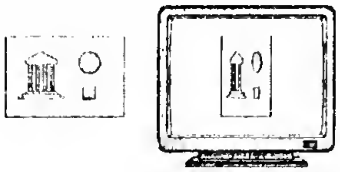
1. Pick an initial point (x, y, z) at random inside the triangle.
2. Select one of the three vertices at random.
3. Find the location halfway between the initial point and the randomly selected vertex.
4. Display this new point by putting some sort of marker, such as a small circle, at the corresponding location on the display.
5. Replace the point at (x, y, z) with this new point.
6. Return to step 2.

Thus, each time that we generate a new point, we display it on the output device. This process is illustrated in the figure below, where p_0 is the initial location and p_1 and p_2 are the first two locations generated by the above algorithm.

Write a program that draws a two dimensions Gasket starting from a three points triangle specified by {0.0, 0.0}, {25.0, 50.0}, {50.0, 0.0} in considering the initial point inside the triangle (step 2) as {7.5, 5.0} and do the repetition (step 6) 5000 times



3) a) The following figure shows a scene that appears deformed when displayed on the output screen of an OpenGL program
   - Discuss possible reasons that could lead to the shown deformation
   - How you can avoid such deformations?



b) Approximate the curve specified by the implicit equation: $\left(\frac{x}{3}\right)^2 + \left(\frac{y}{2}\right)^2 - 1 = 0$ using the Marching Squares method. In other words, approximates the contour c=0 of the function $\left(\frac{x}{3}\right)^2 + \left(\frac{y}{2}\right)^2 - 1 = c$ using the Marching Squares method

4) a) What is the purpose of each of the following OpenGL function calls? Explain how the parameters are used, if any.
   i) glClear(GL_COLOR_BUFFER_BIT);
   ii) glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB | GLUT_DEPTH);
   iii) glEnable(GL_DEPTH_TEST);
   iv) glOrtho(-50. 0,50.0 ,-50.0, 50.0, -50.0, 50.0);

b) Write a C++ program that draws a spinning square on the screen. The square should start spins when the user click the left mouse button and stops spinning when the user click the right mouse button. The square also should remain square even if the user reshaped the application-drawing window.

5) a) In the context of OpenGL programming, explain the following
   - Picking
   - Interactive modeling

b) Based on the fundamentals you learned in this course, design a simple paint program using OpenGl. The program should be able to clear the drawing window, draw rectangles and circles. State clearly the steps of the design, the components of the application, and the function of each component.

Best wishes... the examination committee

قسم هندسة الحاسبات و التحكم الآلي
الدرجة الكلية : 40 درجة
المادة :مجتمع تكنولوجيا المعلومات الفرقة الثانية حاسبات
كود القرر :CCE22H3 الزمن: 2 ساعة التاريخ : يونيو 2015

أجب عن الأسئلة التالية:

السؤال الأول:- (12 درجة)

"الحفاظ علي البيانات أهم من الحفاظ علي جهاز الحاسب نفسه"
في ضوء العبارة السابقة اذكر ما يلي:

1- ماهي خطة مواجهة الكوارث؟
2- اذكر كيف يمكنك اثبات انك مفوضا في مكان عملك ؟
3- ما هي الخطوات التي يمكن اتخاذها في وضع سياسة امن البيانات؟

السؤال الثاني:- (10 درجة)

" يستخدم برنامج ACCESS لإنشاء والتعامل مع قواعد البيانات "
في ضوء العبارة السابقة اذكر ما يلي:

1- ماالمقصود بقاعدة البيانات؟ و ماالفائدة من استخدامها.
2- ماهو حقل المفتاح وما فائدته؟
3- ماهي انواع البيانات التي يمكن تخزينها في احد حقول البرنامج ؟

السؤال الثالث :- (10 درجات)

1- ماهي مكونات نظام الأرشيف الألكتروني وكذلك نظام الحضور الألكتروني ؟
2- ما هي مراحل اتخاذ القرار؟

السؤال الرابع:- (8 درجات)

1- What is cloud computing? And what are the main characteristics of it?
2- Compare between Public cloud computing, and Private cloud computing?

Course Title: Signals and Systems	Course Code: CCE2210	Year: 2nd
Date: 14 /6 /2015 (Second term)	Allowed time: 3hrs	No. of Pages: (2)

Answer the following questions

Question (1) (25 Marks)

a) A coupled mass–spring mechanical system is shown in Fig. 1. **Obtain**:
   i) The differential equations describing the system.
   ii) The transfer function $G(s) = Z_1(s)/F(s)$.
   iii) The state space model.

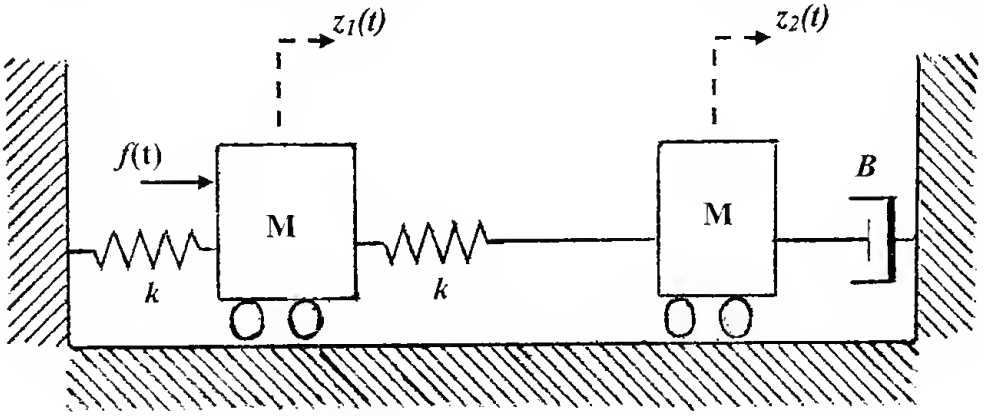


Fig. 1 Coupled mass–spring system

b) Consider the armature-controlled DC motor shown in Fig. 2. The voltage $v_a(t)$ is the motor armature voltage; the current $i_a(t)$ is the motor armature current. $R_a = 1.6\Omega$ and $L_a = 0.1\,H$ are the armature resistance and inductance, respectively, $J = 0.1\,N.m/rad./\sec^2$. is the moment of inertia of load, $B = 0.4\,N.m/rad./\sec.$ is the coefficient of viscous friction, $k_t = 0.3\,N.m/A$ is the torque constant and $k_b = 0.2V/rad./\sec.$ is the back *e.m.f* constant. $T(t)$ is the motor torque generated at the motor shaft in (*N.m.*), $\omega(t)$ represents the angular speed of motor shaft in (*rad./sec.*) and $\theta(t)$ represents the angular position of motor shaft in (*rad.*).

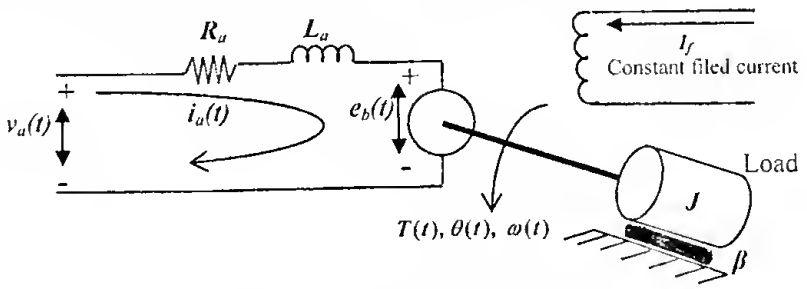


Fig. 2 Armature–controlled DC motor

i) **Write** the differential equations describing the motor in the time domain.

ii) **Draw** the equivalent block diagram.

iii) **Obtain** the transfer function $G(s) = \dfrac{\theta(s)}{V_a(s)}$ using Mason's gain formula.

iv) From the transfer function obtained in (iii), **draw** the state diagram and **find** the state space model in controllable and observable canonical forms.

Question (2) (20 Marks)

a) When the unity feedback second order system shown in Fig. 3 is subjected to a unit-step input, the system response contains overshoot of **77%**, occurring after time of **0.0325 (sec.)** has elapsed. **Find** the rise time and the time to settle down to within 2% of the final value.

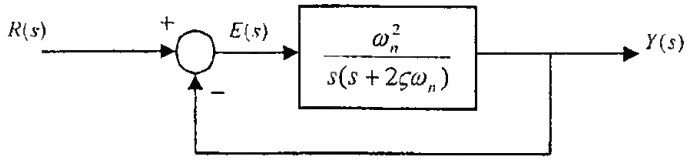


Fig. 3 Unity feedback second order system

b) A unity feedback closed-loop system has open-loop transfer function which is given by:

$$G(s) = \frac{2k}{s(s+1)(s+2)}$$

i) If k = **1.5 (sec^{-1})**, **determine** the steady-state error (e_{ss}) for unit-step and unit-parabolic inputs.

ii) For unit ramp input, **what is the minimum** value of k for e_{ss} < **0.1**.

Question (3) (23 Marks)

a) Consider a unity negative feedback system shown in Fig. 4. By using Routh stability, **find the range** of k for which the system has damped oscillatory output response.

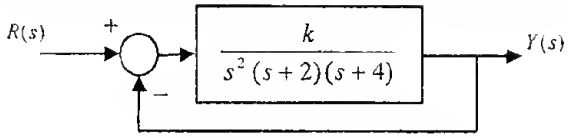


Fig. 4 Closed-loop system

b) Consider a unity feedback system with the process transfer function which is given by:

$$G(s) = \frac{1}{(s+4)(s+8)(s+12)}$$

By using **Ziegler-Nichols (Z-N)** tuning method, **design** a PID controller as depicted in Fig. 5. Also, **draw** the electrical circuit of PID controller using operational amplifiers.

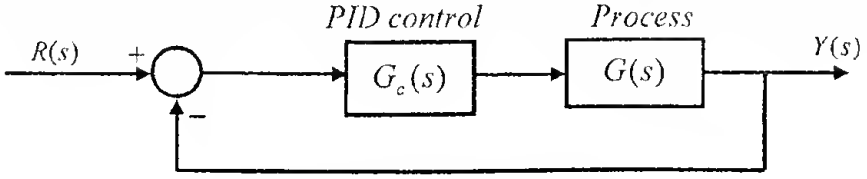


Fig. 5 Controlled closed- loop system

Question (4) (22 Marks)

a) Consider a system represented by: $\dddot{y}(t) + 6\ddot{y}(t) + 11\dot{y}(t) + 6y(t) = \ddot{u}(t) + 4\dot{u}(t)$

Obtain the state-space model in the diagonal and series (cascaded) forms.

b) For the system described by the following state space representation, **find**:

i) The eigenvalues and check stability. ii) The transition matrix.

iii) The transfer function. iv) The unit-step response for zero initial conditions.

$$\dot{x}(t) = \begin{bmatrix} 0 & 6 \\ -1 & -5 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

$$y(t) = \begin{bmatrix} 1 & 0 \end{bmatrix} x(t)$$

Good Luck

Dr. Eng. Wael M. Elawady

Tanta University

Department: Computers and Control Eng.
Total Marks: 90 Marks

Faculty of Engineering

Course Title: **Computer Architecture**	Course Code: **CCE2209**	Year: **2nd** Computers
Date: **31 /05/2015 (2nd term)**	Allowed time: **3:00 hr**	No. of Pages: **(2)**

Remarks: **Please Read the question more than once to fully understand it before you start solving.**

Question (1) (Total 25 Marks)

1) Design the datapath inside the processor for three-bus organization then write the control sequence required to add the contents of memory location LOC to register R1 and store the result into R2. Assume that the instruction consists of two words. The first word specifies the operation and the addressing mode, and the second word contains the number LOC. **(7 Marks)**

2) Write a microroutine of the microprogrammed control unit for the control sequence in question (1-1). **(6 Marks)**

3) Compare between hardwired and microprogramed control units and draw their block diagrams. **(6 Marks)**

4) Design the datapath inside the processor for single-bus organization then write the control sequence of unconditional branch instruction. **(6 Marks)**

Question (2)(Total 25 Marks)

1) Show that the logic expression $c_n \oplus c_{n-1}$ is a correct indicator of overflow in the addition of two's complement integers by using an appropriate truth table. **(5 Marks)**

2) Design 16-bit carry look-ahead adder with minimum gate delay that adds $A_{0\text{-}15}$ to $B_{0\text{-}15}$ then produces $S_{0\text{-}15}$ and C_{16}. Show how many gates are required to build the 16-bit carry look-ahead adder and find the logic delay of S_{15} and C_{16}. **(6 Marks)**

3) Multiply the following pair of signed two's complement numbers using :
A=110101 and **B=011011** **(8 Marks)**
   a) Booth's algorithm.
   b) Bit-pair encoding algorithm.

4) Using restoring division perform the operation A % B on the numbers **A=1000** and **B=11.** **(6 Marks)**

000 | 00 | 0 | 00 |
256 128 64 32 16 8 4 2 1

00 0 11 → -11
0 11 0 11 → 27

297

Question (3)(Total 25 Marks)

1) Compare between a subroutine and an interrupt service routine.

(6 Marks)

2) The address bus of a computer has 16 address lines, A15–0. If the address assigned to one device is $(7CA4)_{16}$ and the address decoder for that device ignores lines A8 and A9, what are all the addresses to which this device will respond?

(6 Marks)

3) Virtual memory is a technique that automatically moves program and data between main memory and secondary storage when they are required for execution:
   a) State its benefits.
   b) Explain how to convert virtual address into physical address.

(6 Marks)

4) A block set associative cache consists of a total of 64 blocks divided into 4 block sets. The main memory contains 4096 blocks, each consisting of 128 words.
   a) How many bits are there in a main memory address.
   b) How many bits are there in each of the tag, set, and word fields.

(7 Marks)

Question (4) (Total 15 Marks)

1) Compare between CISC and RISC approaches. **(5 Marks)**
2) Given :

Program (1)

```
    R1=20
LP: Shift-Right  R2
    Decrement R1
    Branch-if ≠0   LP
    ADD    R2, R3
```

Program (2)

```
Move    #5,R1
ADD     R1,R2
Shift-Left  R2
```

Suggest a suitable software and hardware solutions for Program (1) and Program (2) to get high performance for execution.

(6 Marks)

3) Compare between pipelined and superscalar processors.

(4 Marks)

With my best wishes

Course Coordinator: Dr. Mahmoud Alshewimy